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Expert Report of Professor Meredith Rosenthal

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I. QUALIFICATIONS

1. My name is Meredith B. Rosenthal. I am the C. Boyden Gray Professor of Health Economics and Policy at the Harvard T.H. Chan School of Public Health and an Academic Affiliate of Greylock McKinnon Associates (“GMA”), a consulting and litigation support firm. My principal research interests concern the economics of the health care industry.

2. At Harvard, I have taught in undergraduate, Masters- and Ph.D.-level health economics and health policy courses. Since 1996, I have worked on a number of consulting matters through GMA, most of which relate to litigation in health care markets generally and the pharmaceutical industry in particular. I have also submitted written testimony in litigation concerning alleged anticompetitive conduct for a variety of drugs, which are listed in Attachment A. Most relevant to the current matter, I have submitted written and in some cases presented oral testimony in litigation concerning allegations of improper marketing of the following prescription drugs: Actiq,¹ Bextra,² Celexa and Lexapro,³ Lyrica and Zyvox,⁴ Geodon,⁵

¹ *In re: Actiq Sales and Marketing*, United States District Court for the Eastern District of Pennsylvania, No. 07-CV-4492.

² *In re: Bextra Marketing Sales Practices and Product Liability Litigation*, United States District Court for the Northern District of California, MDL No. 1699, No. M:05-CV-01699-CRB.

³ *In re: Celexa and Lexapro and Sales Practices Litigation*, United States District Court for the District of Massachusetts, Case No. 09-MD-2067 (NMG); MDL No. 2067.

⁴ *Mary K. Jones v. Pfizer Inc., et al.*, United States District Court for the Southern District of New York, Civil Action No. 1:10-cv-03864-AKH.

⁵ *In re United States of America v. Pfizer, Inc.*, United States District Court for the District of Massachusetts, Case No. 1:10-CV-11166-DPW.

Ketek,⁶ Lupron,⁷ Neurontin,⁸ Nexium,⁹ Premarin, Prempro and Premphase,¹⁰ Risperdal,¹¹
Rituxan,¹² Vioxx¹³ and Zyprexa.¹⁴

3. I have conducted research on a wide variety of health economics topics, with a focus on the financing and organization of the U.S. health care system. Specific topics I have studied include the effect of payment incentives on provider behavior,¹⁵ payment and delivery system

⁶ *Sergeants Benevolent Association Health and Welfare Fund v. Sanofi-Aventis U.S. LLP*, United States District Court for the Eastern District of New York, No. 08-CV-179.

⁷ *In re: Lupron Marketing and Sales Practices Litigation*, United States District Court for the District of Massachusetts, MDL No. 1430, No. 01-CV-10861.

⁸ *In re: Neurontin Marketing and Sales Practices Litigation*, United States District Court for the District of Massachusetts, MDL No. 1629, No. 04-10981; *Gregory Clark and Linda Meashey v. Pfizer Inc.*, and *Warner-Lambert Company, LLC*, Philadelphia County Court of Common Pleas, No. 1819; *Elizabeth Judy and Stephen Brown v. Pfizer, Inc.*, individually and as successor in interest to *Parke-Davis and Warner-Lambert, Inc.*, Circuit Court of the City of St. Louis, State of Missouri, Cause No. 042-01946, Division No. 1; and *In re: Neurontin Marketing and Sales Practices Litigation*, as it relates to: *Kaiser Foundation Health Plan v. Pfizer, Inc.*, United States District Court for the District of Massachusetts, MDL No. 1629, No. 04-10981-PBS, No. 04-10739-PBS.

⁹ *Commonwealth Care Alliance and Glen Crenshaw v. AstraZeneca Pharmaceuticals L.P. and Zeneca Holdings, Inc.*, Commonwealth of Massachusetts, Superior Court, Trial Court Department, No. 05-CV-0269 BLS.

¹⁰ *Krueger v. Wyeth, Inc.*, United States District Court for the Southern District of California, Civil Action No. 03CV2496 JAH (AJB).

¹¹ *Charles Foti, Attorney General ex rel. State of Louisiana v. Janssen Pharmaceutica, Inc.*, 27th Judicial District Court, Parish of St. Landry, No. 04-C-3967-D and *The State of Texas, ex rel. Allen Jones v. Janssen, L.P.*, District Court, 250th Judicial District, Travis County, Texas, No. D-1GV-04-001288.

¹² *United States ex rel. John Underwood v. Genentech, Inc.*, United States District Court for the Eastern District of Pennsylvania, No. 03-CV-3983.

¹³ *Kleinman v. Merck & Co.*, No. ATL-L-3954-04 and *Martin v. Merck & Co.*, No. ATL-L24-05, Superior Court of New Jersey, Law Division, Camden County.

¹⁴ *In re: Zyprexa Products Liability Litigation*, United States District Court for the Eastern District of New York, MDL No. 1596, Civil Action No. 05-CV-4115. I also submitted testimony in related state matters.

¹⁵ See M. Rosenthal, "Risk Sharing and the Supply of Mental Health Services," *Journal of Health Economics*, 19(6), November 2000, pp. 1047-65; M. Rosenthal, R. Frank, Z. Li, and A. Epstein, "From Concept to Practice: Early Experience with Pay-for-Performance," *Journal of the American Medical Association*, 294(14), October 2005, pp. 1788-93; and M. Rosenthal, Z. Li, A. Robertson, and A. Milstein, "Impact of Financial Incentives for Prenatal Care on Birth Outcomes and Spending," *Health Services Research*, 44(5), Part 1, October 2009, pp. 1465-79.

reform,¹⁶ and advertising and promotion of prescription drugs.¹⁷ I have published more than 150 peer-reviewed journal articles, essays, and book chapters.

4. I received an A.B. in International Relations from Brown University in 1990 and a Ph.D. in Health Policy (Economics Track) from Harvard University in 1998. A more complete description of my qualifications is found in my *Curriculum Vitae*, which is included as Attachment A to this Report.

5. I am being compensated at a rate of \$825 per hour for my time. The compensation due to me is for the work performed and it is not contingent upon my opinions, my conclusions, or the outcome of this matter. The opinions I state in this report are stated within a reasonable degree of professional certainty in the areas of healthcare economics and econometrics. I reserve the right to respond to, rebut, opine on, or incorporate opinions offered by other experts in these matters.

¹⁶ See M. Rosenthal, "Beyond Pay for Performance: Emerging Models of Provider-Payment Reform," *The New England Journal of Medicine*, 359(12), September 2008, pp. 1197-1200; M. Rosenthal, M. Friedberg, S. Singer, D. Eastman, Z. Li, and E. Schneider, "Effect of a Multipayer Patient-Centered Medical Home on Health Care Utilization and Quality: The Rhode Island Chronic Care Sustainability Initiative Pilot Program," *JAMA Internal Medicine*, September 2013, PMID: 24018613; and S. Edwards, M. Abrams, M. Rosenthal, *et al.*, "Structuring Payment to Medical Homes After the Affordable Care Act," *Journal of General Internal Medicine*, 2014, PMID: 417661.

¹⁷ M. Rosenthal, *et al.*, "Promotion of Prescription Drugs to Consumers," *The New England Journal of Medicine*, 346(7), February 2002, pp. 498-505; M. Rosenthal, *et al.*, "Demand Effects of Recent Changes in Prescription Drug Promotion," *Forum for Health Economics & Policy*, 6(1), January 2003, pp. 1-26; M. Mello, M. Rosenthal, and P. Neumann, "Direct-to-Consumer Advertising and Shared Liability for Pharmaceutical Manufacturers," *Journal of the American Medical Association*, 289(4), January 2003, pp. 477-81; J. Donohue, E. Berndt, M. Rosenthal, A. Epstein, and R. Frank, "Effects of Pharmaceutical Promotion on Adherence to the Treatment Guidelines for Depression," *Medical Care*, 42(12), December 2004, pp. 1176-85.

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TABLE 6
MAXIMUM PERCENT OF MMEs EXPLAINED BY CLINICALLY JUSTIFIABLE USES

National Estimates, 1993-2018						Actual MMEs Sold	Percent in Excess of Maximum Clinically Justifiable Opioid Uses
Year	Cancer	Trauma	Surgery	Total	Total + 50%		
1995	2,861,525,677	4,625,186,038	6,409,923,310	13,896,635,025	20,844,952,537	18,772,080,876	25.97%
1996	2,855,148,549	4,617,967,501	6,382,363,792	13,855,479,842	20,783,219,763	21,873,462,479	36.66%
1997	2,841,460,557	4,610,748,965	6,354,804,274	13,807,013,795	20,710,520,693	25,920,208,524	46.73%
1998	2,836,327,442	4,603,530,428	6,327,244,756	13,767,102,626	20,650,653,940	32,696,110,786	57.89%
1999	2,867,658,186	4,596,311,892	6,299,685,238	13,763,655,315	20,645,482,973	43,216,719,992	68.15%
2000	2,871,862,451	4,589,093,355	6,272,125,720	13,733,081,526	20,599,622,289	57,661,469,498	76.18%
2001	2,863,952,129	4,581,874,819	6,244,566,202	13,690,393,149	20,535,589,724	63,769,859,807	78.53%
2002	2,862,225,094	4,574,656,282	6,217,006,684	13,653,888,060	20,480,832,090	84,394,141,166	83.82%
2003	2,835,389,288	4,567,437,746	6,189,447,166	13,592,274,199	20,388,411,299	99,538,252,112	86.34%
2004	2,801,036,403	4,560,219,209	6,161,887,648	13,523,143,260	20,284,714,890	113,467,432,097	88.08%
2005	2,802,613,239	4,553,000,673	6,070,634,430	13,426,248,341	20,139,372,512	126,316,338,351	89.37%
2006	2,780,881,572	4,527,506,760	6,066,004,644	13,374,392,976	20,061,589,464	142,567,094,664	90.62%
2007	2,764,733,691	4,509,337,560	6,061,374,858	13,335,446,109	20,003,169,164	159,468,968,951	91.64%
2008	2,745,234,129	4,553,328,570	6,056,745,072	13,355,307,771	20,032,961,656	178,153,878,388	92.50%
2009	2,723,541,919	4,502,250,900	6,052,115,286	13,277,908,105	19,916,862,157	190,797,575,017	93.04%
2010	2,720,139,135	4,598,301,120	6,047,485,500	13,365,925,755	20,048,888,632	211,124,683,303	93.67%
2011	2,692,447,190	4,499,305,860	5,996,996,250	13,188,749,300	19,783,123,950	224,787,125,832	94.13%
2012	2,674,157,851	4,553,358,810	5,946,507,000	13,174,023,661	19,761,035,491	215,174,297,180	93.88%
2013	2,642,242,973	4,427,317,230	5,896,017,750	12,965,577,953	19,448,366,929	204,476,610,735	93.66%
2014	2,631,363,034	4,481,465,100	5,845,528,500	12,958,356,634	19,437,534,950	198,407,257,313	93.47%
2015	2,608,260,888	4,480,815,308	5,858,732,950	12,947,809,145	19,421,713,718	187,924,913,913	93.11%
2016	2,594,425,251	4,473,596,771	5,831,173,432	12,899,195,454	19,348,793,181	176,998,684,608	92.71%
2017	2,575,445,358	4,466,378,235	5,803,613,914	12,845,437,506	19,268,156,259	154,743,694,586	91.70%
2018	2,556,465,464	4,459,159,698	5,776,054,396	12,791,679,558	19,187,519,338	55,937,815,582	77.13%
Total	66,008,537,468	109,012,148,826	146,168,038,772	321,188,725,066	481,783,087,599	2,988,188,675,761	89.25%

Source: Epidemiological Data: AHRQ HCUP, CDC SEER, HRSA AHRF
Sales Data: IQVIA NPA, ARCOS, CDC

Notes: Total = sum of MMEs needed to appropriately treat 100% of cancer, trauma, and surgery given clinical parameters (Cancer: 80 MMEs/day over 64 days; Surgery and Trauma: 30 MMEs/day over 7 days). Actual MMEs nationally from IQVIA NPA, ARCOS, CDC. Percent in Excess of Maximum Clinical Justifiable Opioid Use = (Actual MMEs Sold - Total Appropriate MMEs)/Actual MMEs Sold. Years for which epidemiological data was not available, linear estimation was used.